



www.intel.com/go/xeon_mp

Does the Intel® Xeon™ processor MP provide optimal business value for enterprise applications?

Yes. The Intel® Xeon™ processor MP is exclusively designed for data-intensive enterprise applications.



The Intel® Xeon™ processor MP is exclusively designed for four processor or higher servers, providing performance, price/performance, headroom and scalability thanks to a number of technical innovations:

- Intel® NetBurst™ microarchitecture to support higher frequencies. The Intel Xeon processor MP was initially introduced up to 1.60 GHz, and is now available up to 2 GHz.
- Hyper-Threading Technology, an innovative technology that allows two threads from multithreaded applications to be executed simultaneously.
- Integrated Three-Level Cache Subsystem for cache-hungry, data-intensive applications. The Intel Xeon processor MP was initially introduced with 256KB L2 and up to 1MB iL3 cache, and is now available with 512KB L2 and up to 2MB iL3 cache.

For more details on the features, benefits and technologies of the Intel Xeon processor MP, please refer to the Intel® Xeon™ Processor MP Performance Guide, Quick Reference Guide and Buyer's Guide which can be located at:

www.intel.com/eBusiness/products/server/processor/xeon_mp

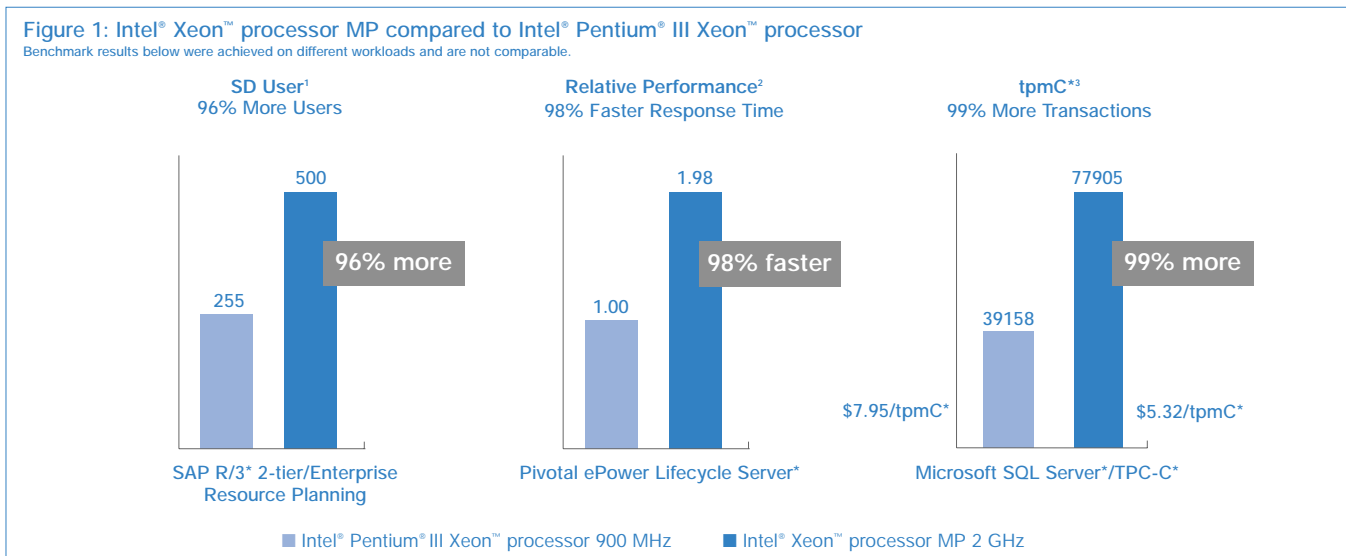


New Levels of Performance

The Intel Xeon processor MP brings new levels of performance and price/performance to multi-processor (MP)-based server platforms. Figure 1 compares the additional performance seen in Intel Xeon processor MP-based servers to previous generations of MP-based servers.

Things to note:

- Figure 1 shows comparisons of the 900 MHz Intel® Pentium® III Xeon™ processor with the Intel Xeon processor MP, now available up to 2 GHz with 2MB iL3 cache. The Intel Xeon processor MP at 2 GHz with iL3 cache will support 96% more users, allow a 98% faster response time and up to 99% more transactions than servers based on Pentium III Xeon processors at 900 MHz with 2MB cache. Performance advantages will be even greater when compared to 700 MHz or 550 MHz Pentium III Xeon processor-based servers.



System Configurations:

¹ Source: www.sap.com (May 3, 2001)

1) Intel® Pentium® III Xeon™ processor 900 MHz, 2MB L2 cache in IBM eServer® xSeries® 350, 4-way SMP running Microsoft Windows® 2000 Advanced Server, IBM DB2® UPB v.7.2;

2) 4 Intel® Xeon™ processors MP 2 GHz, 2MB iL3 cache in HP ProLiant® Model DL560, 4-way SMP with 5GB main memory, running Microsoft Windows® 2000 Advanced Server, Microsoft SQL Server® 2000 and the R/3® SD Benchmark, release 4.6C.

² Source: Intel Corporation

1) 4 Intel® Pentium® III Xeon™ processors 900 MHz with 2MB L2 cache in an Intel® SRPL8 server, 2GB main memory, running Pivotal ePower Lifecycle Server®, Microsoft Windows® Server 2003, and Microsoft SQL Server® 2000;

2) 4 Intel® Xeon™ processors MP 2 GHz with 2MB iL3 cache in an Intel® SSH4 server, 2GB of main memory, running Pivotal ePower Lifecycle Server®, Microsoft Windows® Server 2003, and Microsoft SQL Server® 2000.

³ Source: www.tpc.org (February 2003)

1) 4 Intel® Pentium® III Xeon™ processors 900 MHz with 2MB L2 cache in an HP ProLiant® DL580 6/900 server with 8GB of main memory and 3084GB of total disk space, running Microsoft Windows® 2000 Advanced Server, and Microsoft SQL Server® Enterprise Edition (system availability date: Oct 15, 2001);

2) 4 Intel® Xeon™ processors MP 2 GHz with 2MB iL3 cache in an HP ProLiant® DL580 G2 server, 32GB of main memory and 4286GB of total disk space, running Microsoft Windows® Server 2003 Enterprise Edition, and Microsoft SQL Server® 2000 Enterprise Edition SP3 (system availability date: Dec 31, 2002).

Enterprise Application Characteristics

The Intel Xeon processor MP has been designed exclusively for MP environments to support the demands of key enterprise applications. Features in the Intel Xeon processor MP match key enterprise application characteristics⁴.

Many applications execute in parallel operations, which makes great demands on the processor. Adding multiple processors improves solution performance.

Multiple processors can be even more effective if the application is deliberately written to provide separate processor streams or threads that can be distributed across the processor set. On top of multiple processors, multithreaded applications will gain an additional performance boost if each of those processors features Hyper-Threading Technology.

⁴ These characteristics are not mutually exclusive. Many applications exhibit some or all of these features. This list is not meant to be all inclusive.

For applications requiring very large data sets, when the complete data set can be held in local memory, the analysis will execute much faster.

Cache memory allows frequently accessed data to be available to the processors with less waiting. Some cache helps nearly all applications, but many applications are cache hungry because they require frequent data access cycles.

Advantages of MP-based Platforms

While MP-based platforms offer performance headroom, scalability, large cache, multiple-processor and large memory support (up to 64GB), they offer further advantages, for key enterprise applications, over dual-processor (DP)-based systems or DP-based clustered systems including:

- **Cost-effective Capacity:** Servers with 4 or more processors typically deliver substantially greater capacity and faster response times per investment dollar than a 2-way or single-processor server.
- **Simplified Environment:** The use of larger MP-based servers reduces the total server count in the computing environment.
- **Lower Operational Costs:** The use of larger servers simplifies the infrastructure and reduces the drain on data center resources, such as power, cooling, floor space and network bandwidth.

Advantages of MP-based Platforms Over DP-based Platforms

For key multithreaded enterprise applications, especially those with frequent data access cycles and large data sets, servers based on the Intel Xeon processor MP offer better performance and headroom, at comparable price/performance, to DP-based platforms. Let's examine two typical enterprise application workloads.

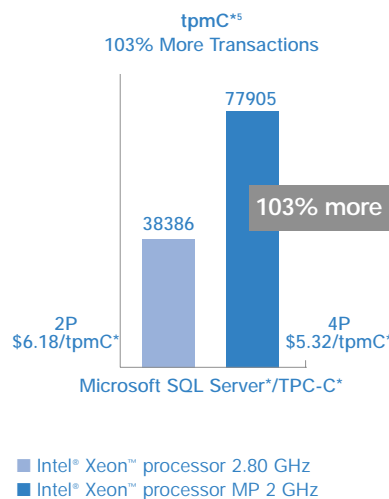
TPC-C* Version 5

A common benchmark for measuring On-Line Transaction Processing (OLTP) is TPC-C* Version 5 from the Transaction Processing Council. TPC-C simulates a complete computing environment where a population of users executes transactions against a database. Metrics are transaction per minute (tpmC*) and price/performance (\$/tpmC*). Figure 2 compares TPC-C performance and price/performance for 4-processor Intel Xeon processor MP-based servers and an Intel Xeon processor-based server.

You can see that a typical 4-way Intel Xeon processor MP configuration delivers 103% more transactions than typical Intel Xeon processor based servers, at a slightly reduced cost per transaction. In other words, the MP-based configuration delivers better business value for computationally intensive OLTP environments.

Note that Figure 2 shows comparisons with the Intel Xeon processor MP at 2 GHz with 2MB iL3 cache.

Figure 2: Comparison of DP and MP-based enterprise application performance



System Configurations:

⁵ Source: www.tpc.org (February 2003)

- 1) 2 Intel® Xeon™ processors 2.80 GHz with 512KB L2 cache in an HP ProLiant® ML530G2T 2P server with 16GB of main memory and 3891GB of total disk space, running Microsoft Windows® Server 2003 Enterprise Edition and Microsoft SQL Server® 2000 Enterprise Edition (system availability date: Mar 31, 2003);
- 2) 4 Intel® Xeon™ processors MP 2 GHz with 2MB iL3 cache in an HP ProLiant® DL580 G2 server, 32GB of main memory and 4286GB of total disk space, running Microsoft Windows® Server 2003 Enterprise Edition and Microsoft SQL Server® 2000 Enterprise Edition SP3 (system availability date: Dec 31, 2002).

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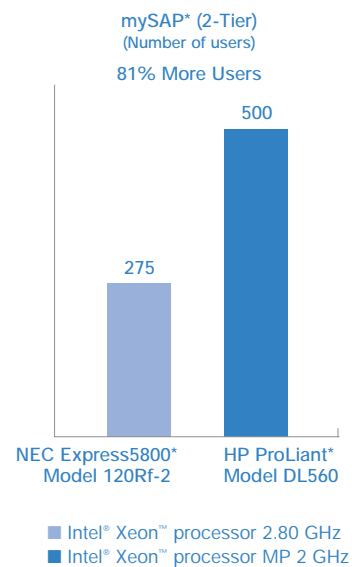
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Figure 3 compares a 4-way Intel Xeon processor MP-based server and an Intel Xeon processor-based server running the 2-Tier mySAP* Sales and Distribution (SD) benchmark. The metric is number of users supported.

Here, we see that a typical 4-way Intel Xeon processor MP configuration delivers over 81% more users than a typical DP-based configuration.

As with TPC-C, as the Intel Xeon processor MP now runs at up to 2 GHz, with up to 2MB iL3, the productivity advantages will be even higher.

Figure 3: Comparison of DP and MP-based 2-Tier mySAP* SD performance*



System Configurations:

* Source: www.sap.com (April 10, 2003)

- 1) 2 Intel Xeon processors 2.80 GHz, 512KB L2 cache in NEC Express5800* Model 120Rf-2, 2-way SMP with 4GB main memory running Microsoft Windows* 2000 Advanced Server, Microsoft SQL Server* 2000 and the R/3* SD Benchmark, release 4.6C.
- 2) 4 Intel Xeon processors MP 2 GHz, 2MB iL3 cache in HP ProLiant* Model DL560, 4-way SMP with 5GB main memory running Microsoft Windows* Server 2003, Enterprise Edition, Microsoft SQL Server* 2000 and the R/3* SD Benchmark, release 4.6C.

Summary

The Intel Xeon processor MP, designed exclusively for 4-way and greater servers, provides productivity gains over DP-based server platforms. The combination of Intel NetBurst microarchitecture, Hyper-Threading Technology and Integrated Three-Level Cache Subsystem (with up to 2MB of iL3 cache) provide the performance and scalability required for demanding enterprise applications and strategic consolidation projects.

For the latest performance data, please refer to www.intel.com/eBusiness/products/server/processor/xeon_mp/, then click on "performance benchmarks: Compare Performance: Intel Xeon processor MP-based servers."

For more details on the Intel Xeon processor MP please refer to:
www.intel.com/go/xeon_mp

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing.

The Intel Xeon processor MP may contain design defects or errors known as errata, which may cause the product to deviate from published specifications. Such errata are not covered by Intel's warranty. Current characterized errata are available on request.

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